
Space Weather Technical Forecast

Issued on Friday 6 December 2024 at 12:07 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Low to Moderate solar activity. Slight chance G1/Minor Storm Day 4 (09 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with an M1.2 flare peaking at 06/0920 UTC from AR3917. There are eight active regions currently on the disc, however the majority of these are small and simple, with no significant development occurring. AR3912 in the southwest is showing some minor magnetic complexity, but has a fairly simple structure, with a main leader spot and much smaller trailers. AR3916 in the southeast also appears to be comprised of a relatively small leader spot followed by simple trailers. AR3917 following AR3916 is perhaps the most active region currently on the disc, however this appears to be a fairly small and simple bipolar group.

No Earth-directed CMEs were observed in the last 24 hours.

Solar Wind / Geomagnetic Activity: Solar winds, as recorded at L1 by ACE, declined from slightly elevated to background levels, with wind speeds initially around 430 km/s, then near 380 km/s by the end of the period. Density was largely below average. Total Interplanetary Magnetic Field (IMF), Bt, was weak at 7nT or below, while the north-south component varied weakly between +/- 6nT. Phi angle was mostly negative (towards the Sun). Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: High energy proton flux observed by GOES18 was at background levels. High energy electron flux (greater than 2MeV) observed by GOES16 was at background levels. The associated 24-hour fluence was below Active. The 06/0000UTC observation was 1.54e6 integrated pfu.

Four-Day Space Weather Forecast Summary

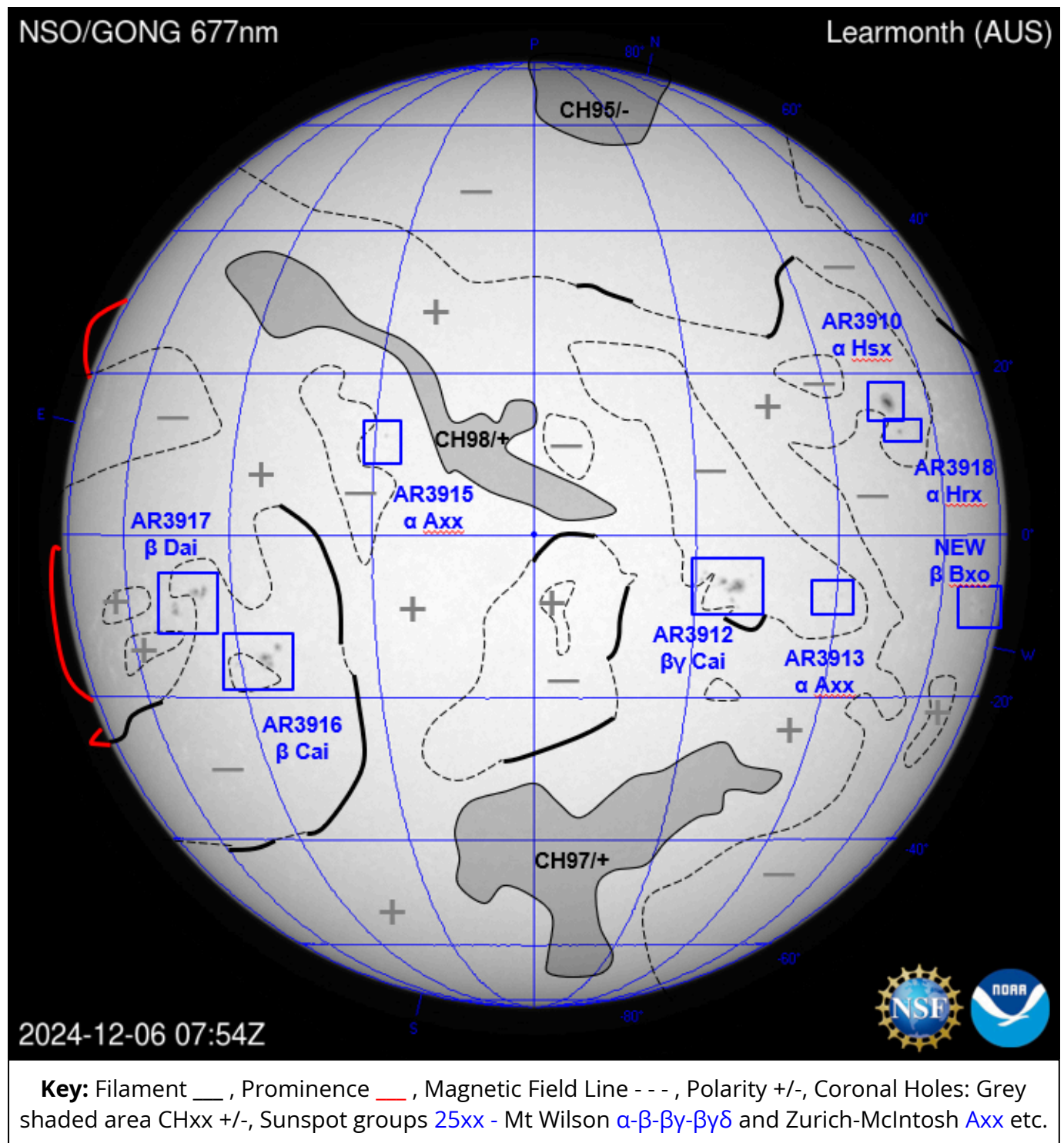
Solar Activity: Low to Moderate activity is expected with a chance of isolated M-flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs currently expected. Background or perhaps slightly elevated solar wind speeds are likely to continue through Days 1-3 (06-08 Dec). Then there is a likely connection to the fast wind from CH98/+ on Day 4 (09 Dec), or perhaps after the end of this period. Wind speeds of 450-500 km/s are probable.

Overall mainly Quiet conditions at first, which may increase to Unsettled to Active with a slight chance of G1/Minor Storm intervals by the end of Day 4 (09 Dec).

Energetic Particles / Solar Radiation: High energy protons are expected to persist at background levels. High energy electron flux is also expected to persist at background levels, with the associated 24 hour fluence remaining below the Active threshold.

Figure 1: Solar synoptic map valid 06/0800 UTC.



Geomagnetic Storms

There are no Earth-directed CMEs currently expected.

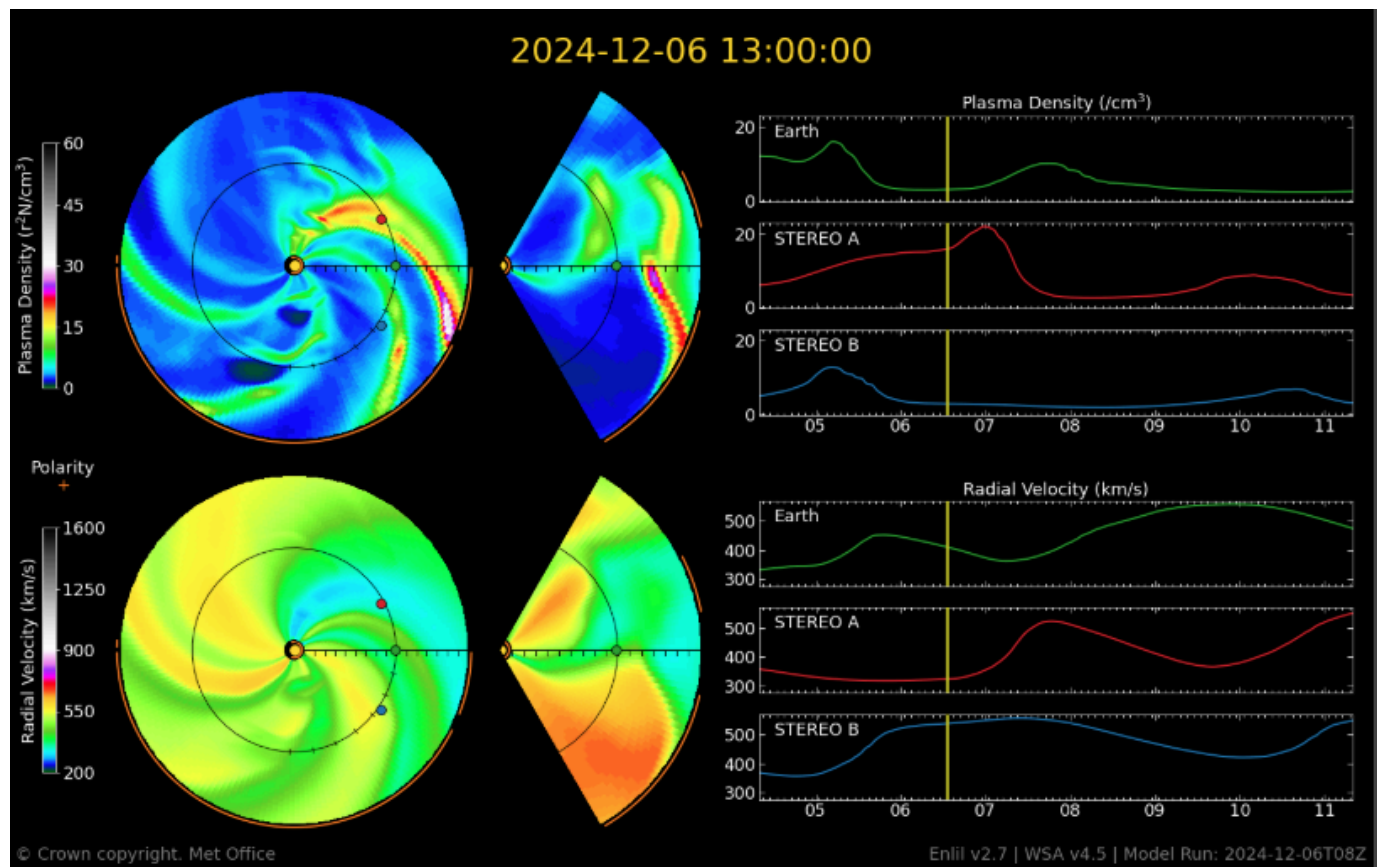
MOSWOC Enlil has a weak connection to persistent CH97/+, however this is considered too far south to have a significant influence at Earth. This is supported by the previous rotation where wind speeds only reached just above 400 km/s, despite the coronal hole being located further north that time round. Background or perhaps slightly elevated solar wind speeds are likely to continue through Days 1-3 (06-08 Dec).

Then there is a likely connection to the fast wind from CH98/+ on Day 4 (09 Dec), or perhaps after the end of this period. The latest MOSWOC Enlil now suggests a connection to this feature on 08-09 Dec, which is an improvement on previous runs which were bringing it in much too soon. This feature was present on the previous rotation, with the leading edge slightly further back than this time around, suggesting a faster onset than previously. However, wind speeds only reached just over 450 km/s last time so similar speeds of 450-500 km/s are likely. Confidence remains low for any notable geomagnetic activity however, as this is less favoured towards the solstices (Russell-McPherron effect).

Overall mainly Quiet conditions at first, which may increase to Unsettled to Active with a slight chance of G1/Minor Storm intervals by the end of Day 4 (09 Dec).

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	1	1	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: MOSWOC Enlil showing a HSS onset 08-09 Dec, which is likely to be a little too soon.



Radio Blackouts - X-Ray Flares

There are eight active regions currently on the disc, however the majority of these are small and simple, with no significant development occurring. AR3912 in the southwest is showing some minor magnetic complexity, but has a fairly simple structure, with a leader spot and much smaller trailers. AR3916 in the southeast also appears to be comprised of a relatively small leader spot followed by simple trailers. AR3917 following AR3916 is perhaps the most active region currently on the disc, however this appears to be a fairly small and simple bipolar group.

Far-sided products have no strong signals for returning groups from over the east limb, despite the potential for AR3904 and AR3898 to soon move back onto the disc. These may be related to some magnetic looping evident just over the southeast limb in GOES SUVI 195, while a further cluster of loops is evident in the northeast. Both these areas could be sources of oncoming activity.

Low to Moderate activity is expected to continue with an ongoing chance of M-flares and just a very slight chance of X-flares.

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability		(Yes/No)	(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	50	50	50	50
Very Active	R3-R5 (X Class)	No	5	5	5	5

Figure 3: X-ray flux at GOES16 and 18, with one M-flare in the last 24 hours.



Solar Radiation Storms (High Energy Protons)

GOES18 proton flux is currently at background levels and is expected to remain at this level with the sunspot regions on the Earth-facing disc currently small and relatively simple.

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = cm ⁻² sr ⁻¹ s ⁻¹)						

High Energy Electrons ($\geq 2\text{MeV}$)

High energy Electron flux observed by GOES16 is at background levels. This is expected to persist, with no significant coronal hole or CME enhancements currently anticipated during the forecast period.

The associated 24-hour fluence is expected to persist below Active levels, with MOSWOC REFM currently considered to be providing good guidance.

GEO Electron Environment	Level ($\text{cm}^{-2}\text{sr}^{-1}\text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2\text{ MeV}$ $\geq 1 \times 10^8$	No	1	1	1	1
Very Active	$\geq 2\text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1

Figure 4: MOSWOC REFM showing a below Active forecast, which is considered good guidance.

